

his opinion strenuously against astronomers who still regarded them as appendages of the moon. Afterwards he occupied himself chiefly with the constitution of the sun, and with the study of spots and prominences. He presented the Observatory with a direct-vision spectro-scope by Hoffman, the instrument with which he pursued his researches up to the time when he was confined to his bed in October 1890.

On the death of Émile Plantamour, Gautier was nominated Director of the Observatory of Geneva, and from the outset displayed great activity in endowing this establishment with new instruments. In meteorology the eye observations have been completed by a self-recording barograph by Hipp, reversing thermometers by Negretti and Zambra, self-recording thermometer and hygrometer by the brothers Richard, and during the last year an anemograph by the same makers. The Meteorological Station of Great Saint-Bernard, which is a sub-station to the Observatory of Geneva, had been likewise supplied with a barograph. In chronometry, an important branch of the Observatory, apart from the usual tests installed by É. Plantamour, Gautier instituted two competitions for the studies of errors of compensation. He has presented the Observatory with an electrical pendulum of extreme accuracy made by Hipp.

If we speak of the man, all astronomers with whom he was acquainted, and they were many, will agree in saying that he was the type of a true gentleman. His cordial welcome, his frankness, his good nature, and his readiness to help, gained for him in succession the love of everyone. A day of great happiness for him was that on which the Astronomische Gesellschaft resolved to make Geneva the place of meeting in 1885; those who took part in this Congress were able to enjoy his good nature and frank hospitality, and yet a few days before he experienced a cruel grief.

Émile Gautier died from heart disease, by which he was carried suddenly away on the night of February 24-25.

A. R.

NOTES.

THE "Flora of British India" has reached the seventeenth part—in other words, the first part of the sixth volume has appeared, and Sir Joseph Hooker may be congratulated on having so nearly accomplished his great task. Since his retirement from the Directorship of Kew Gardens, Sir Joseph has worked single-handed, and several large families yet remain to be done, notably the grasses, which are very numerous, and, in some respects, more difficult than the petaloid monocots, and mainly so because the majority of the species have a much wider area of distribution, thus entailing more literary research. The last published part of "The Flora of British India" is of more than ordinary interest, inasmuch as it contains the conclusion of the descriptive account of the orchids of India. About 1400 species are described; they are referred to upwards of a hundred genera, and they constitute about ten per cent. of the flowering plants of that vast country. This is a larger proportion than that recorded for the rich orchid flora of Mexico and Central America. Among epiphytal, or tree orchids, the beautiful genus *Dendrobium* contributes upwards of 150 species, and *Habenaria* among ground orchids numbers 106 species. All lovers of orchids will welcome this masterly synopsis of the Indian species; and all botanists will wish the eminent author health to finish his great work.

THE Camera Club has issued the programme of the fifth annual Photographic Conference, which will be held in the theatre of the Society of Arts on Tuesday and Wednesday, April 7 and 8, under the presidency of Captain Abney. On Tuesday Captain Abney will deliver his presidential address, and

papers will be read by Mr. L. Clark, Mr. Joseph Pennell, and the Rev. F. C. Lambert. Major Nott, Mr. C. V. Boys, and Sir H. T. Wood will read papers on Wednesday, and in the evening the members and their friends will dine together at the Criterion Restaurant. All photographers are invited to attend the Conference. The annual exhibition of photographs by members will be on view in the Club-house meeting-room, Charing Cross Road, from 10 a.m. to 4 p.m., and it will remain open for about six weeks.

THE Congress of German Geographers was opened in Vienna yesterday. A Geographical Exhibition in connection with the Congress was on view at the University. The exhibits consisted chiefly of photographs, maps, and charts.

THROUGH the death of Mr. Henry Groves, on March 1, at the age of fifty-six, of paralysis, the English colony at Florence has lost one of its most active scientific members. Mr. Groves had been in business in Florence as a pharmaceutical chemist for about thirty years, and had given the whole of his leisure time to the investigation of the flora, not only of Tuscany, but of nearly the whole of Italy, of which he possessed an exceptional knowledge. His vast stores of information were always at the service of English and other visitors to Florence. His dried collection of Italian plants was probably unrivalled in extent, and has, we are informed, become the property of the Central Botanical Society of Tuscany.

ON Thursday last, about midday, two distinct shocks of earthquake were felt at Boscastle, North Cornwall. The first shock was very severe, shaking the windows and furniture in some of the houses. The second shock followed in about two minutes. It was not quite so severe, but was distinctly felt. Some people state that they felt the ground trembling under their feet for several seconds.

DR. H. WILD read a paper before the Imperial Academy of Sciences of St. Petersburg on January 16 last on the use of the electric light for photographic self-registering instruments. He finds that it is more economical than gas or petroleum, and gives more uniform and sharper curves. Also that it reduces the possibility of loss of continuous registration to a minimum, and completely prevents the disturbance caused by increase of temperature when gas or oil is used.

MR. C. CALLAWAY has submitted to the Shropshire County Council a report on technical education; and now the Staffordshire County Council has invited him to prepare a similar report on technical instruction in the district occupied by the industries of North Staffordshire.

MR. R. L. WIGHTON has been appointed Professor of Engineering and Naval Architecture at the Durham College of Science, Newcastle-upon-Tyne.

DR. WILLIAM SOMERVILLE, having been appointed to the chair of agriculture and forestry recently founded in the Durham College of Science, Newcastle-upon-Tyne, will begin his duties early in the summer. The College has acquired 15 acres of land at Gosforth for the purposes of an experimental station, and it is hoped that smaller stations will be established in other parts of the district. It is the desire of the College that the members of the staff of its agricultural department should assist in the establishment of a system of agricultural education throughout the adjoining counties, partly by a system of "extension lectures" and partly by conducting special classes for teachers.

THE *Revue Biologique du Nord de la France* publishes a paper by M. J. de Guerne on the new steam yacht recently built in London for the Prince of Monaco. The *Princess Alice* is, in fact, a sailing vessel with an engine and screw-propeller to help

it; the proprietor much prefers sailing to steaming. The boat contains three laboratories very well equipped for zoological work, as well as photography and oceanography; and a short trial cruise is to be made in the autumn.

At the Royal Institution, Mr. J. Scott Keltie will on Tuesday, April 7, begin a course of three lectures on the geography of Africa, with special reference to the exploration, commercial development, and political partition of the continent; Prof. Dewar will on Thursday, April 9, begin a course of six lectures on recent spectroscopic investigations; and Prof. Silvanus P. Thompson will on Saturday, April 11, begin a course of four lectures on the dynamo. The Friday evening meetings will be resumed on April 10, when Sir William Thomson will give a discourse on electric and magnetic screening.

PROF. KARL PEARSON proposes to deliver at Gresham College lectures on the following subjects: April 14, the geometry of motion; April 15 and 16, matter and force; April 17, the classification of the sciences. These lectures begin at 6 o'clock p.m., and are free to the public.

THE following lectures on scientific subjects are to be given at the Royal Victoria Hall:—April 7, "Minute Things in Nature," by Prof. Rupert Jones; April 14, "Extinct Volcanoes of France," by Dr. Crosskey; April 21, "Mountain Exploration in the Caucasus," by Mr. Dent.

LAST August various gentlemen connected with agricultural industry in different parts of the United Kingdom were invited by the High Commissioner for Canada to visit the Dominion, to report upon its agricultural resources, and the advantages the country offers for the settlement of farmers and farm labourers. The reports of these gentlemen have now been issued. If published together, they would have made a rather bulky volume; so it was decided that they should be divided into four parts. They present a great mass of useful and well-arranged information, and are carefully illustrated.

THE *Revue Mensuelle de l'École d'Anthropologie de Paris*, of which three numbers have now been published, is likely to do much good work in extending among the educated classes of France a knowledge of anthropological science. Among the contributors are MM. G. de Mortillet, Andre Lefèvre, and C. Letourneau.

ACCORDING to a telegram sent through Dalziel's Agency, a magnificent grotto has been discovered near Ajaccio. It is entered with difficulty, owing to the smallness of the aperture; but upon his entrance the explorer finds himself in a vast and lofty hall, the sides of which are some 25 yards in height. From this there are several passages leading to an indefinite number of other chambers. A thorough investigation of the grotto has not yet been made.

THE following are some results of a study of 197 thunderstorms in Russia in 1888, with reference to their speed of travel. The author (Herr Schönrock) obtained as mean velocity about 28·5 miles an hour, with variation from 13 to 50 miles. In the hot season the velocity was less than in the cold (28 m. against 32 m.). It was least in the early morning, then increased, at first slowly, then faster, reaching a maximum between 9 and 10 p.m. Thunderstorms travel most quickly from south-west, west, and north-west. An interesting geographical difference was observed. From west to east the velocity increased at first; but about 30° to 35° east longitude a maximum was reached, and further east the speed declined; the decline showing, however, a secondary maximum between 45° and 50°.

THE Annual Report of the Berlin branch of the German Meteorological Society contains the results of rainfall observations at a number of stations in and near Berlin for the year 1890. This year is among the driest experienced since 1848,

when regular observations were begun; the months of February and September, especially, are the driest on record. Dr. Hellmann, the Secretary, has carried on some useful experiments to determine the influence of the height of rain-gauges upon the records of rainfall—a matter of considerable importance in towns, owing to the difficulty of obtaining a good exposure at a low level. He finds that about a quarter of the rainfall is lost in an elevated exposure, such as on the roof of a house, during strong winds; but he arrives at the important conclusion that an elevated exposure is permissible if the gauge can be protected from the disturbing influence of the wind. The Report also contains a list of the severe winters since 1728. The coldest winter was 1788; on December 28 a minimum of $-21^{\circ}6$ was recorded.

A KNOWLEDGE of how water behaves with regard to passage of different light-rays through it is important, not only for determining the colour of the substance, but also for ascertaining what rays penetrate to the inhabitants of ocean depths. This matter has been studied lately by Herren Hüfner and Albrecht, with the aid of the new spectro-photometry (*Wied. Ann.*). Above or below the spectrum obtained directly from a beam of sunlight passing to the spectro-photometer, was thrown one from an equally strong beam which had passed through a water column of known length. The intensities of the two spectra were then compared in a series of sections by means of the polarization apparatus, and the coefficients of extinction determined. It was proved that the light-extinction by water is in general greater the longer the wave-length. But the curve of transmitted light has not a regular course; in the region of D and G, where broad absorption bands have been observed, it shows sudden rises.

ABOUT 18° C., according to Herr Kleinstrick (*Beibl.*), Japanese and ordinary wax sink in water, but above 18° they float. This is because the wax has a much greater coefficient of expansion than water, and under 18° it has a higher specific gravity.

THERE is reason to believe that the indications of tromometers are sometimes vitiated by wind. This matter has been lately investigated by M. Carcani, who made inquiry at four Observatories (Rome, Mestre, Florence, and Rocca di Papa), the tromometers of which were quite isolated from the floors or walls of buildings. At the last-named station, the instrument is in a cavern several metres under the surface. M. Carcani finds, in many cases, synchronism between the maxima of wind and of tremors; on an average, in 84 per cent. of the observations. As it is difficult to suppose this coincidence fortuitous, it is inferred that wind-pressure enters as an important factor into the movements of the tromometer. It is pointed out that, in the case of a tromometer isolated in a building, the oscillations caused in the latter by wind exert pressure on the ground, and so affect the instrument. In a case like that of Rocca di Papa, the direct pressure of the wind on sloping ground has to be considered; the vibrations so produced may be transmitted to some distance from their place of origin, like tremors of earthquake nature. Mr. Carcani finds, in this particular case, many instances of rise and fall in the tromometric intensity, corresponding with rise and fall of wind. In view of these facts, tromometric observations, he considers, should be made only when the wind is not very high.

WITH reference to observed changes in the earth's axis of rotation, it has been pointed out that through changes in distribution of air-pressure and movement of water masses, considerable differences of level in the ocean may be produced. Herr Lamp notes (*Astr. Nachr.*) the displacement northwards of the maxima of air-pressure in the trade-wind region, and of ocean currents, as the sun rises in summer. Thus a certain quantity

of water passes over in summer from the southern to the northern hemisphere; and it is improbable that compensation takes place by means of under-currents. As the year advances, water passes back to the southern hemisphere, reaching there a maximum in our winter. This periodical transference of mass is supposed to cause periodical variation in the earth's axis. Herr Lamp calculates that to cause a change of latitude of 0°·5, it would be sufficient that at 180° longitude from Berlin, a water-mass of 2500 cubic metres should move in a meridional direction from 30° S. lat. to 35° N. lat.; and that with reference to the oceanic area concerned, we need only suppose a mean elevation of 10 cm. (or 4 inches) in the sea-level.

THE Director of the Agricultural Experiment Station of the Agricultural and Mechanical College for the State of Alabama has issued his Bulletin No. 13, which is devoted to an exhaustive account of the different varieties of cotton grown in the State, by Mr. P. H. Mell, the botanist and meteorologist to the station. According to Mr. Mell, only three species of *Gossypium* are of special commercial importance, viz. (1) *G. Bahma*, or Egyptian cotton; (2) *G. barbadense* or *nigrum*, Sea-Island cotton, or long staple, or black-seed cotton; (3) *G. herbaceum* or *album*, short staple, or upland, or green-seed cotton. These three species have been multiplied into 20 or 30 so-called varieties, by certain kinds of cultivation and careful selection. *G. Bahma* is supposed to be originally a hybrid between the native Egyptian cotton-plant and a species of *Hibiscus*. The "Sea-Island" cotton requires a salt atmosphere, and is mainly used in the manufacture of lace. Mr. Mell gives the microscopic characteristics of 25 varieties of cotton, and his descriptions are accompanied by photographic illustrations made with a photo-micro camera and micrometer. The Bulletins are supplied free on application to any citizen of the State.

ACCORDING to the *Japan Mail*, the Japanese Government has made an award of \$1000 to Dr. Shohei Tanaka, a graduate in science of the Tokio University and of the Berlin University, for the invention of a new musical instrument, as to which the following information is given. In Germany, Dr. Tanaka devoted himself specially to the study of sound and of music, and is no doubt the first Japanese who has obtained an intimate knowledge of Western music on its practical, theoretical, scientific, and historic sides. On the purely scientific side he has added to our knowledge of the laws of vibrations of plates, and has also communicated to musical literature several papers of interest. One of these contains an account of a harmonium which he has devised, and which is tuned in practically pure intonation. From a cursory glance at the contents of this pamphlet, it is difficult to pick out the really original matter. Judging from the references and foot-notes, the author has read widely, and appears to be warranted in claiming to be the first who has constructed a keyed instrument capable of giving practically pure chords in all the usual keys, and of being played almost exactly as a piano or an organ is played. The manual is, to a first glance, very similar in appearance to the ordinary organ or piano manual. But a closer inspection shows that a short black note is introduced between E and F, and that the other black notes are divided into two or even three. In all, there are twenty distinct notes within the compass of an octave, instead of the usual twelve in our instruments of equal temperament. Dr. Tanaka's white notes are tuned to the perfect major scale of C, the E being therefore considerably flatter than the note of the same name on the piano. If it is desired to play on the scale of D, this E, the true major third to C, must not be used. A slightly but appreciably sharper note must be used, and this is inserted between D and E, in front of the ordinary black note known as D sharp or E flat. Strictly speaking, as

on Bosanquet's organ for instance, D sharp and E flat are really different notes, but the difference is too slight to be practically appreciable. In Dr. Tanaka's scheme, however, the requirements of modern transposition in music necessitate a C sharp distinct from D flat.

THE additions to the Zoological Society's Gardens during the past week include a Purple-faced Monkey (*Semnopithecus leucoprymnus*) from Ceylon, presented by Mrs. Sutton Sams; a Sooty Mangabey (*Cercocebus fuliginosus* ♂) from West Africa, presented by Miss Kathleen Hill; an Indian Civet (*Viverricula malaccensis*), two Malabar Squirrels (*Sciurus maximus*) from India, presented by Colonel A. Bloomfield; a Two-spotted Paradoxure (*Nandinia binotata*) from West Africa, presented by Dr. J. Galbraith Westlake; a Laughing Kingfisher (*Dacelo gigantea*) from Australia, presented by Mr. Charles C. Barton; five Summer Ducks (*Æx sponsa* 5 ♀) from North America, four Gadwalls (*Chaulelasmus streperus* ♂ ♂ ♀ ♀), European, purchased; a Black-headed Lemur (*Lemur brunneus*), born in the Gardens.

SCIENCE IN NEW ZEALAND.

THE following is the Presidential address delivered by Sir James Hector, at the recent meeting of the Australasian Association for the Advancement of Science:—

When I rashly replied in the affirmative to the cablegram which I received from our Secretary in Melbourne, asking me to undertake the honourable and responsible duties which I have to commence this evening, I fear I did not fully realize the difficulties of the position, but since then the sense of my unfitness for the task has become very oppressive. To address an assembly of this kind on general science must involve unusual difficulties, owing to the audience being largely composed of those who, only taking a casual interest in scientific discussions, look chiefly to the results; while, at the same time, there are present professional specialists in almost every branch of knowledge. I feel that on this occasion I must be ruled by the interest of the majority, and claim the forbearance of my fellow-workers in science if I have to refer in a sketchy way to subjects in which they are deeply interested, and far more learned than I profess to be.

Seeing that I am addressing a Christchurch audience, I hope I may be permitted, in the first place, to say a word concerning one whose scientific services should, without doubt, have obtained for him the position of first President in New Zealand of the Australasian Association. We naturally recall the name of Sir Julius Von Haast on this occasion, and mourn for the loss the colony has sustained of one who for thirty years occupied a most prominent position. His early researches in the North Island in company with Von Hochstetter, were followed by the exploration of the remote districts on the west coast of Nelson, after which Canterbury secured his distinguished services, and enabled him to leave that monument of his varied scientific knowledge, shrewd capacity, and indefatigable industry which is to be found in the Canterbury Museum. There are others of our fellow-colonists whose wide range of experience would have peculiarly fitted them to act as your President, and I am able to say that had our veteran colonist and explorer Sir George Grey felt more assured in health and strength, it would have been your pleasure this evening to listen to a flood of eloquence on all scientific topics that relate to the future development of Australasia. There is another name I feel must be mentioned as one who should have been in this position had his health permitted. I refer to the Rev. William Colenso, who is not only the greatest authority on the folk-lore of the Maoris, on whom he was among the first to confer a printed literature in their own language. His long-continued work as a field naturalist, and especially as a botanist, is exceedingly interesting, seeing that it forms a connecting link that has continued the early spirit of natural history research in New Zealand, that commenced with Banks and Solander, and was continued by Menzies, Lesson, the two Cunninghams, and Sir Joseph Hooker, prior to the arrival of colonists. Thus we still have in my esteemed friend, Mr. Colenso, an active veteran naturalist of what we may call the old school of explorers.